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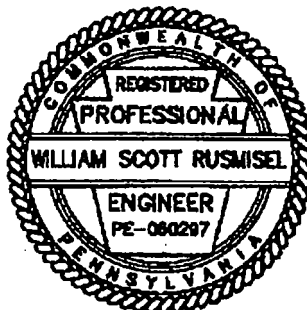
EROSION AND SEDIMENTATION CONTROL PLAN NARRATIVE

Made For

**RANGE RESOURCES – APPALACHIA, LLC
KERNS FRESH WATER IMPOUNDMENT**

Situate In

**HOPEWELL TOWNSHIP
WASHINGTON COUNTY, PA**



RECEIVING STREAM (USGS BLUE LINE): BRUSH RUN (WWF)

DISTANCE TO NEAREST USGS BLUE LINE STREAM: 400 FT.

NO ANTICIPATED WETLAND IMPACTS

C-17523-0002

Date: December 30, 2008

Revised: January 22, 2009

THE GATEWAY ENGINEERS, INC.

Prepared By: (b) (4), E.I.T.

Reviewed By: (b) (4), P.E.

EROSION AND SEDIMENTATION CONTROL PLAN NARRATIVE

PLAN NAME: Kerns Fresh Water Impoundment

LOCATION: Hopewell Township, Washington County, PA.

Chapter 93 Watershed Classification: receiving stream is an Unnamed Tributary to Brush Run and is classified as a High Quality Warm Water Fishery (HQ-WWF)

Past and Present Land Uses: The site proposed for construction of the Impoundment has historically and is currently farmed for hay.

The following narrative is accordance with PA Title 25, Chapter 102 Rules and Regulations, Section 102.5:

102.5 (b) The erosion and sedimentation control plan shall be designed to prevent accelerated erosion and sedimentation and shall consider all factors which contribute to erosion and sedimentation including, but not limited to, the following:

102.5(b)(1) The topographic features of the project area.

Existing contours are shown on the attached Erosion and Sedimentation Control Plan at 2 foot intervals.

102.5(b)(2) The types, depth, slope and aerial extent of the soils.

Refer to Appendix B for on-site soils information.

102.5(b)(3) The proposed alteration to the area.

The proposed alterations to the project area include construction of a fresh water impoundment for use in fracturing the Marcellus shale gas wells. The proposed development will disturb approximately 9.9+/- acres.

(a) Explain erosion and sedimentation control function of permanent site features and/or facilities.

Any unpaved disturbed area will be seeded with a mixture specified in the planting specifications.

(b) Indicate how and where topsoil will be removed, temporarily stockpiled, and then replaced.

Topsoil will be stripped and stockpiled on-site at the approximate locations shown on the Erosion & Sedimentation Control Plan. Stockpiled topsoil will be utilized when returning the site to original conditions.

102.5 (b)(4) The amount of runoff from the project area and the upstream watershed area and the method of calculation used.

(a) Watershed boundaries on and off site.

The watershed boundaries are shown by the existing topography and proposed grades on the Erosion and Sedimentation Control Plan.

(b) Show that all discharge points are in compliance with section 102.13 with regard to allowable velocity.

No new point discharges will be created.

102.5 (b)(5) The staging of earthmoving activities.

(a) Construction Sequence

The Kerns Fresh Water Impoundment will consist of one (1) general phase of construction. All E&S facilities shall be installed in accordance with the approved E&S/SWM Plan and the DEP Erosion and Sediment Pollution Control Program Manual dated July, 2001 or latest version.

A generalized construction sequence is provided below. The construction sequence is intended to provide a general course of action in order to conform to the applicable regulatory agency requirements for temporary and permanent soil erosion and sediment pollution control. All necessary parts for proper and complete execution of work pertaining to this plan, whether specifically mentioned or not, are to be performed by the contractor. It is not intended that the drawings and this report show every detailed piece of material or equipment. The contractor shall comply with all requirements listed in this section. The contractor may be required to alter controls based on effectiveness of controls or differing conditions encountered.

- 1. Stake out limit of disturbance for grading operations. In addition, orange construction fence shall be placed around any and all environmental features to be protected on the site.**
- 2. Install rock construction entrance according to the detail provided in the location shown on the plan.**
- 3. Install super silt fence as shown on the plan below areas of proposed disturbance.**

4. Clear area for construction of Temporary Diversion Channels, DCT-1A and DCT-1B and cross drain at site entrance. Install channels according to the detail provided; immediately install protective lining as specified.
5. Install 30" silt fence below area of proposed Temporary Sediment Trap 1.
6. Clear and remove topsoil at the proposed area of Temporary Sediment Trap 1 and stockpile at the nearest location as shown on the plan.
7. Begin construction of Temporary Sediment Trap 1 as shown on the plan. Verify soil from the excavation of Trap 1 for suitability as embankment material. Geotechnical engineer may verify soil capabilities. As soon as embankment is brought to final grade, immediately seed and mulch for stabilization in regular 10' vertical increments to promote early stabilization of the fill slope.
8. Complete construction of Temporary Sediment Trap 1, install clean out stake and complete seeding and mulching of all exterior trap slopes.
9. Begin construction of Temporary Interceptor Channels, ICT-1A and ICT-1B, in the locations shown and according to the details provided on the plan. Install channel liners and seed and mulch for stabilization.
10. Clear and grub remainder of site within limits of disturbance as shown on the plans.
11. Clear topsoil from the area of the proposed Fresh Water Impoundment and stockpile at the nearest locations as shown on the plan. Immediately install 30" filter fabric fence below topsoil stockpiles.
12. Begin construction of Fresh Water Impoundment as shown on plans. Verify soil from the excavation of Fresh Water Impoundment for suitability as embankment material. Geotechnical engineer may verify soil capabilities. As soon as embankment is brought to final grade, immediately install erosion control blanket and seed and mulch for stabilization in regular 15' vertical increments to promote early stabilization of the slopes.
13. Install emergency spillway and impermeable pond liner according to the detail and specifications provided.
14. Construct rock pad on pond embankment in the location shown for staging pumping equipment.
15. Complete construction of Fresh Water Impoundment and complete seeding and mulching of all exterior basin slopes.
16. Fresh Water Impoundment shall remain in operation as needed. Once drilling operations have been complete, the Fresh Water Impoundment shall be removed. Dewater the Fresh Water Impoundment and commence grading operations to fill pond. Grading shall restore the site to the condition and grade prior to impoundment construction.
17. Replace topsoil, seed and mulch all disturbed areas, using the specified seeding requirements found on the detailed plan. All disturbed areas must be temporarily stabilized if remaining idle, or anticipated to remain idle. In the absence of a soil test, lime should be added at a rate of 275 lbs / 1000 s.f. Likewise, the fertilizer rates should be increased to 1250 lbs/ac. of 8-16-16 and 2000 lbs/ac. of 5-10-10.
18. Remove Temporary Diversion Channels, DCT-1A and DCT-1B, regrade channel areas to existing conditions, seed and mulch all surrounding disturbed area for stabilization.

19. Reseed all disturbed areas if vegetation is not established after 30 days.
20. Remove Sediment Trap 1 and Temporary Interceptor channels ICT-1A and ICT-1B; regrade area to conditions prior to construction. Seed and mulch all surrounding disturbed areas.
21. Remove the rock construction entrance as grading operations are complete.
22. Remove all filter fence following completion of the above steps and after the site has a uniform 70% perennial vegetative cover on unpaved areas.

102.5 (b)(6) Temporary control measures and facilities for use during earthmoving.

Control measures and facilities such as filter fabric fence, slope blanketing, temporary Interceptor and diversion channels, and temporary seeding will be utilized to control erosion and sedimentation and prevent sediment from leaving the site. See details included in the plans and details.

102.5 (b) (7) Permanent control measures and facilities for long term protection; and use during earthmoving.

Permanent control measures include permanent seeding. Vegetative surface stabilization specifications have been included on the attached Erosion and Sedimentation Control Detail Sheet.

102.5 (b)(8) A maintenance program for the control facilities including disposal of materials removed from the control facilities or project area.

A Maintenance Schedule for the erosion and sedimentation control measures and facilities is included in the attached plans and details. The maintenance of all temporary and permanent erosion and sedimentation control facilities is the responsibility of the contractor(s).

Procedures which ensure that the proper measures for the recycling or disposal of materials associated with or from the project site will be undertaken in accordance with Department regulations.

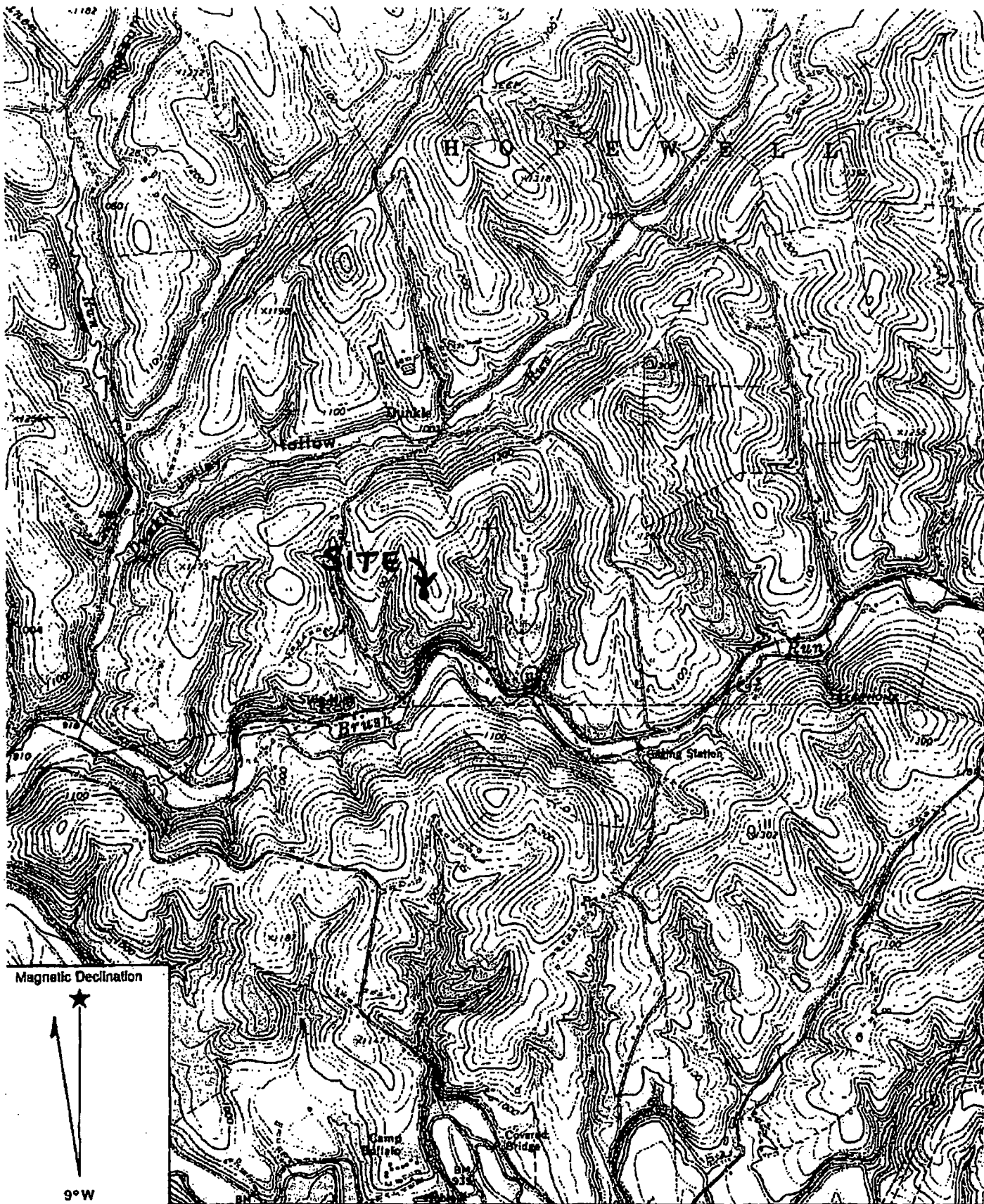
All construction wastes including, but not limited to temporary BMPs, excess soil materials, concrete wash water, sanitary wastes, and any materials that could adversely impact water quality must be disposed of properly at an approved DEP waste site.

No offsite borrow or waste areas are anticipated due to balanced earthwork quantities on site.

Appendices Table of Contents

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| Appendix D | Diversion and Interceptor Channel Calculations |
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Appendix A

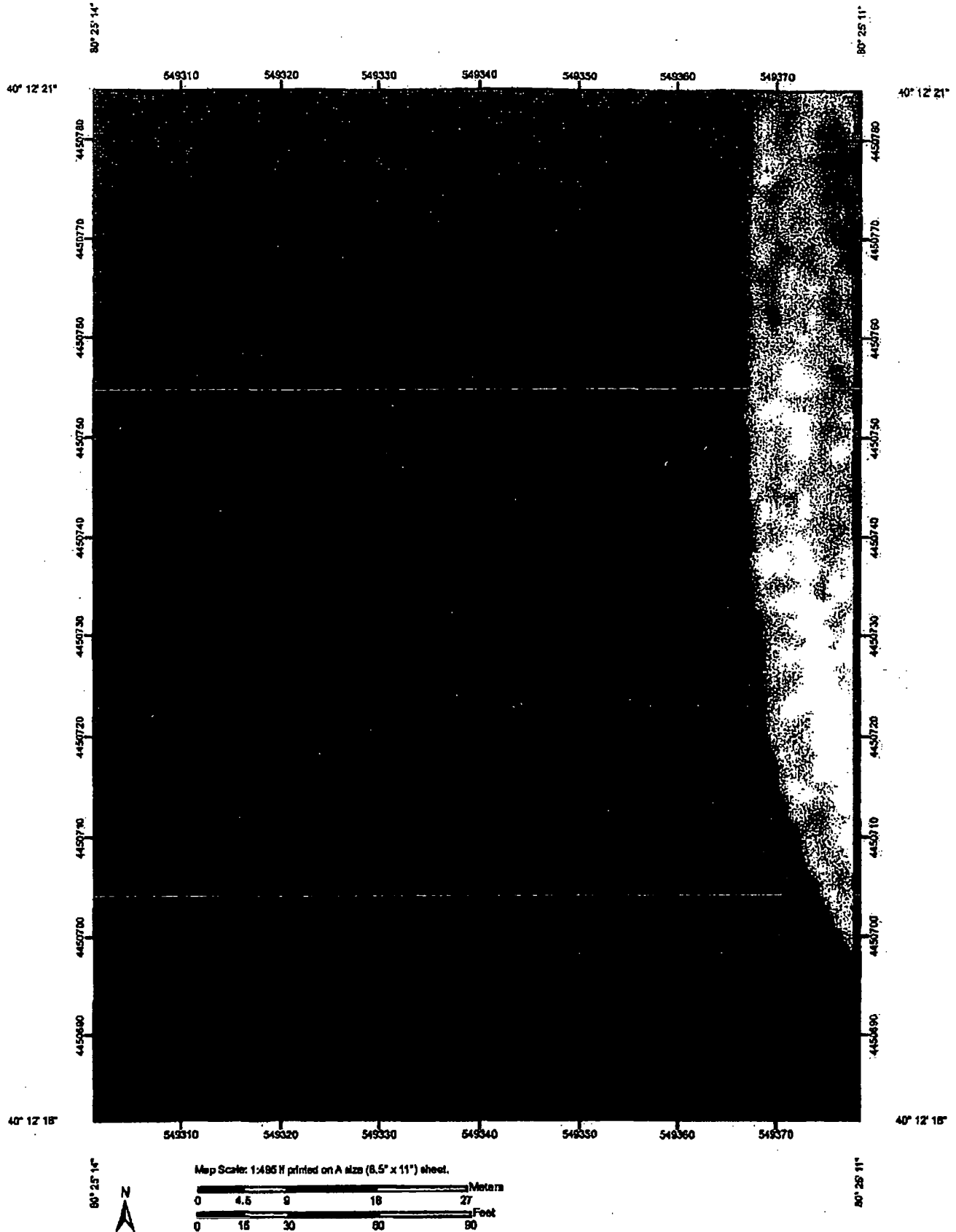


Name: WEST MIDDLETOWN
Date: 12/30/2008
Scale: 1 inch equals 2000 feet

Location: 040° 12' 16.83" N 080° 24' 57.69" W NAD 27
Caption: Kearns Fresh Water Impoundment Hopewell Township
Washington Co.






































Appendix B

Soil Map—Greene and Washington Counties, Pennsylvania
(Kearns Fresh Water Impoundment)



**Soil Map—Greene and Washington Counties, Pennsylvania
(Kearns Fresh Water Impoundment)**

MAP LEGEND

| | | |
|--|---|-----------------|
| Area of Interest (AOI) |  | Very Stony Spot |
|  Area of Interest (AOI) |  | Wet Spot |
| Soils |  | Other |
|  Soil Map Units | Special Line Features | |
| Special Point Features |  Gully | |
|  Blowout |  Short Steep Slope | |
|  Barrow Pit |  Other | |
|  Clay Spot | Political Features | |
|  Closed Depression |  Cities | |
|  Gravel Pit | Water Features | |
|  Gravelly Spot |  Oceans | |
|  Landfill |  Streams and Canals | |
|  Lava Flow | Transportation | |
|  Marsh or swamp |  Rails | |
|  Mine or Quarry |  Interstate Highways | |
|  Miscellaneous Water |  US Routes | |
|  Perennial Water |  Major Roads | |
|  Rock Outcrop |  Local Roads | |
|  Saline Spot | | |
|  Sandy Spot | | |
|  Severely Eroded Spot | | |
|  Sinkhole | | |
|  Slide or Slip | | |
|  Sodic Spot | | |
|  Spill Area | | |
|  Stony Spot | | |

MAP INFORMATION

Map Scale: 1:495 if printed on A size (8.5" × 11") sheet.
The soil surveys that comprise your AOI were mapped at 1:15,840.
Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
Coordinate System: UTM Zone 17N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Greene and Washington Counties, Pennsylvania
Survey Area Data: Version 5, Dec 3, 2008

Date(s) aerial images were photographed: 4/18/1994

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

| Greene and Washington Counties, Pennsylvania (PA011) | | | |
|--|---|--------------|----------------|
| Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI |
| GeC | Guernsey silt loam, 8 to 15 percent slopes | 0.4 | 33.6% |
| GeD | Guernsey silt loam, 15 to 25 percent slopes | 0.7 | 66.4% |
| Totals for Area of Interest | | 1.1 | 100.0% |

Embankments, Dikes, and Levees

| Embankments, Dikes, and Levees Summary by Hydrologic Unit Code (HUC) | | | | | | |
|--|---|--------------|----------------|-----------------------------------|------------|------------|
| HUC | Soil Unit Name | Soil Use | Soil Type | Soil Depth | Soil Depth | Soil Depth |
| GeC | Guernsey silt loam, 8 to 15 percent slopes | Very limited | Guernsey (80%) | Depth to saturated zone (1.00) | 0.4 | 33.6% |
| | | | | Hard to pack (0.04) | | |
| | | | | Thin layer (0.01) | | |
| GeD | Guernsey silt loam, 16 to 25 percent slopes | Very limited | Guernsey (75%) | Depth to saturated zone (1.00) | 0.7 | 68.4% |
| | | | | Hard to pack (0.04) | | |
| | | | | Thin layer (0.01) | | |
| Totals for Area of Interest | | | | | 1.1 | 100.0% |

| Embankments, Dikes, and Levees Summary by Soil Use | | |
|--|-----------|------------|
| Soil Use | Total HUC | Percentage |
| Very limited | 1.1 | 100.0% |
| Totals for Area of Interest | 1.1 | 100.0% |

Description

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. Embankments that have zoned construction (core and shell) are not considered. The soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the suitability of the undisturbed soil for supporting the embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified use. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Appendix C

PROJECT NAME: KERNS FRESH WATER IMPOUNDMENT
LOCATION: HOPKINSON TWP. WASHINGTON CO C-17523-0002
PREPARED BY: LMR DATE: 1/22/09
CHECKED BY: _____ DATE: _____

STAKE

JOINING FENCE SECTIONS

STAPLES

LES

FABRIC

CUTAWAY VIEW

REINFORCING MESH
 { EITHER INDUSTRIAL POLYPROPYLENE
 OR STEEL MESH WITH 6" MAX. OPENING
 STEEL MESH SHALL BE 14 GA. MIN.

SUPPORT STAKE

30"

FABRIC FENCE

MIN. 10 GA. WIRE

COMPACTED BACKFILL

GROUND

EXISTING

18" MIN

6"

TOE ANCHOR TRENCH

1" X 2" X 12" STAKES

**STAKES SPACED @ 8' MAX.
 USE 2" X 2" WOOD OR
 EQUIVALENT STEEL STAKES.**

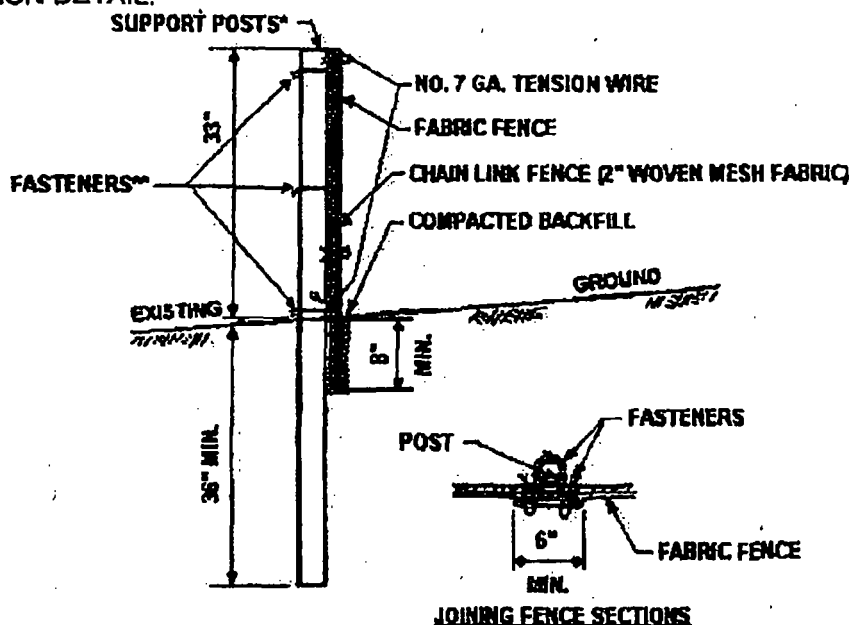
Sediment must be removed where accumulations reach 1/2 the above ground height of the fence.

[illegible]

STANDARD WORKSHEET #6 **Super Filter Fabric Fence**

PROJECT NAME: KERALS FRESH WATER IMPOUNDMENT
 LOCATION: HOPEWELL TWP. WASHINGTON CO. C-17523-8002
 PREPARED BY: CNR DATE: 1/22/09
 CHECKED BY: _____ DATE: _____

CONSTRUCTION DETAIL:



* Posts spaced @ 10' max. Use 2 1/2" dia. galvanized or aluminum posts.

** Chain Link To Post Fasteners spaced @ 14" max. Use No. 6 Ga. aluminum wire or No. 9 galvanized steel pre-formed clips. Chain Link To Tension Wire Fasteners spaced @ 60" max. Use No. 10 Ga. galvanized steel wire. Fabric To Chain Fasteners spaced @ 24" max. C to C.

Filter fabric fence must be installed at existing level grade. Both ends of each fence section must be extended at least 8 feet upslope at 45 degrees to the main fence alignment.

Sediment must be removed where accumulations reach 1/2 the above ground height of the fence.

Any fence section which has been undermined or topped must be immediately replaced with a rock filter outlet. See Rock Filter Outlet Detail.

| BARRIER NO. | LOCATION | SLOPE-PERCENT | SLOPE LENGTH ABOVE BARRIER (FT) |
|-------------|--------------------|---------------|---------------------------------|
| 1 | SOUTH SIDE OF POND | 33 | 118' w/ BLANKET |
| 2 | NORTH SIDE OF POND | 33 | 116' w/ BLANKET |
| | | | |
| | | | |
| | | | |

* BLANKET TO PROVIDE
ADDITIONAL PROTECTION



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DATE: 12/29/08
 PROJECT: KIRK'S IMPOUNDMENT
 JOB NO: 6-17523-0002
 BY: PSC
 CHECKED BY: _____

| LABEL | AREA (Ac.) | i=5.7 (in/hr) | C _w | Q (cfs) | L (ft) | b _w (ft) | d (ft) | Slope (%) | LINING (NA GREEN) |
|--------|---------------|------------------|----------------|------------|-----------|------------------------|-----------|--------------|----------------------|
| DCT-1A | 2.5 | 5.7 | 0.4 | 5.7 | 680 | 2 | 2 | 10.9% | C/25 |
| DCT-1B | 1.5 | 5.7 | 0.4 | 3.4 | 574 | 2 | 2 | 15.6% | C/25 |

USING RATIONAL EQUATION TO CALCULATE

PEAK FLOW TO CHANNEL ASSUME DURATION OF 5 MIN.

USING POINT REGION 1 IDF CURVE FOR 25-YR STORM i = 5.7 in/hr

$$Q = c i A$$

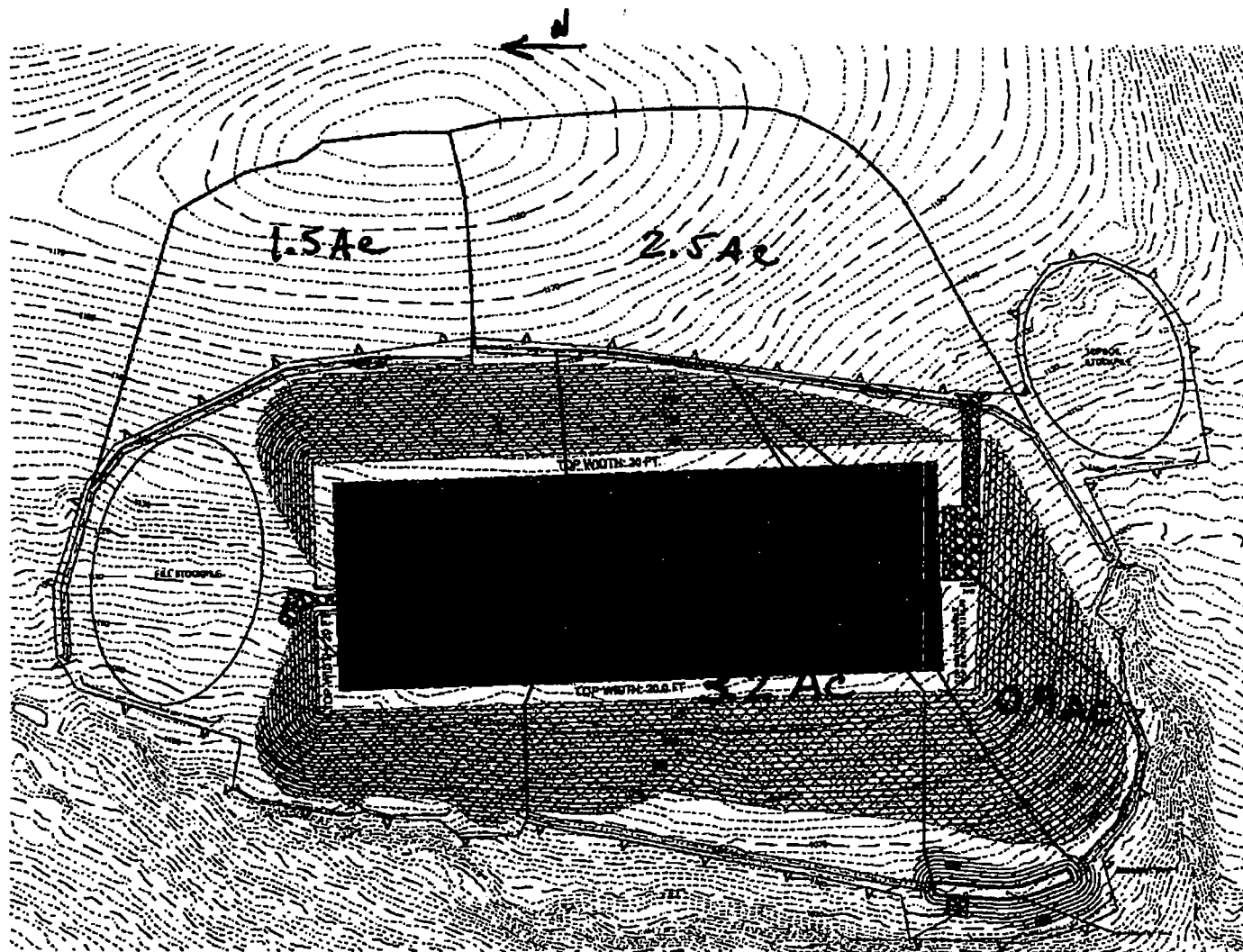
$$\text{DCT-1A } Q = (0.4)(5.7)(2.5) = 5.7 \text{ cfs}$$

$$\text{DCT-1B } Q = (0.4)(5.7)(1.5) = 3.4 \text{ cfs}$$

$$\text{ICT-1A } Q = (0.4)(5.7)(3.2) = 7.3 \text{ cfs}$$

$$\text{ICT-1B } Q = (0.4)(5.7)(0.9) = 2.0 \text{ cfs}$$

| LABEL | AREA (Ac.) | i=5.7 (in/hr) | C _w | Q (cfs) | L (ft) | b _w (ft) | d (ft) | Slope (%) | LINING (NA GREEN) |
|--------|---------------|------------------|----------------|------------|-----------|------------------------|-----------|--------------|----------------------|
| ICT-1A | 3.2 | 5.7 | 0.4 | 7.3 | 400 | 2 | 2 | 2.8 | C/25 |
| ICT-1B | 0.9 | 5.7 | 0.4 | 2.0 | 185 | 2 | 2 | 8.0 | C/25 |

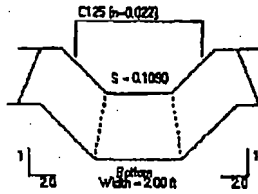


DRAINAGE CHANNEL
DRAINAGE AREA MAP
1"=150'

North American Green - EDMDS Version 4.3 11/22/2009 04:20 PM COMPUTED BY: LWB
 PROJECT NAME: LERHS FOND PROJECT NO: C17523-0002
 FROM STATION/REACH: OCT-1A TO STATION/REACH: OCT-1A DRAINAGE AREA: 2.1 AC DESIGN FREQUENCY: 25 YR TEMP:

HYDRAULIC RESULTS

| Discharge (cfs) | Peak Flow Period (hrs) | Velocity (fps) | Area (sq ft) | Hydraulic Radius (ft) | Normal Depth (ft) |
|-----------------|------------------------|----------------|--------------|-----------------------|-------------------|
| 5.7 | 0.1 | 8.08 | 0.71 | 0.22 | 0.28 |



$$0.28 + 0.5 = 0.78 < 2.0 \checkmark$$

$$0.28(12) = 3.36 > 2.0 \checkmark$$

LINE RESULTS

Not to Scale

| Reach | Channel Type | Stability Analysis | Vegetation Characteristics | | | | Permissible Shear Stress (psf) | Calculated Shear Stress (psf) | Safety Factor | Remarks |
|----------|----------------|--------------------|----------------------------|-------|------|---------|--------------------------------|-------------------------------|---------------|---------|
| | Stable Pattern | | Phase | Class | Type | Density | | | | |
| Straight | C125 | Unregulated | | | | | 2.25 | 1.85 | 1.20 | STABLE |
| | Stable D | | | | | | | | | |

NORTH AMERICAN GREEN EROSION CONTROL MATERIALS DESIGN SOFTWARE VERSION 4.3
NORTH AMERICAN GREEN CHANNEL PROTECTION - ENGLISH/S.I.
USER SPECIFIED CHANNEL LINING BACK-UP COMPUTATIONS

PROJECT NAME: KERNS POND PROJECT NO.: C-17523-0002
COMPUTED BY: LMR DATE: 1/22/2009
FROM STATION/REACH: DCT-1A TO STATION/REACH: DCT-1A
DRAINAGE AREA: 2.5 AC DESIGN FREQUENCY: 25 YR TEMP

INPUT PARAMETERS

Channel Discharge : 5.7 cfs (.16 m³/s)
Peak Flow Period : 0.1 hours
Channel Slope : 0.109 ft/ft (0.109 m/m)
Channel Bottom Width : 2.0 ft (.61 m)
Left Side Slope : 2:1
Right Side Slope : 2:1

Channel Lining : C125 Staple D
Permi. Shear(Tp) : 2.25 psf (107.7 Pa)
Phase = 0

CALCULATIONS

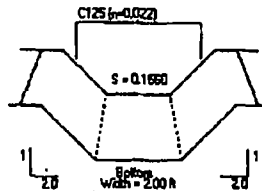
Initial Depth Estimate = $0.16 * (5.7 / (0.109^{0.5}))^{0.375} = 0.47 \text{ ft } (.14 \text{ m})$
Final Channel Depth (after 9 iterations) = .28 ft (0.08 m)
Flow Area = $(2.0 * 0.3) + (0.5 * 0.28^2 * (2.0 + 2.0)) = 0.7 \text{ sq.ft } (0.1 \text{ m}^2)$
Wet Per. = $2.0 + (0.3 * (((2.0^2) + 1)^{1.5} + ((2.0^2) + 1)^{1.5})) = 3.2 \text{ ft } (1.0 \text{ m})$
Hydraulic Radius = $(0.7 / 3.2) = 0.2 \text{ ft } (0.1 \text{ m})$
Channel Velocity = $(1.486 / 0.022) * (0.2^{0.667}) * (0.109^{0.5}) = 8.1 \text{ fps } (2.5 \text{ m/s})$

Channel Effective Manning's Roughness = 0.022
Calculated Shear (Td) = $62.4 * 0.28 * 0.109 = 1.88 \text{ psf } (90.0 \text{ Pa})$
Safety Factor = $(Tp / Td) = (2.25 / 1.88) = 1.20$

North American Green - ECOM5 Version 4.3 11/22/2009 10:20 PM COMPILED BY: LMR
 PROJECT NAME: KERHS POND PROJECT NO.: C-1752-0002
 FROM STATION/REACH: OCT-18 TO STATION/REACH: OCT-18 DRAINAGE AREA: 1.5 AC DESIGN FREQUENCY: 25 YR TEMP:

HYDRAULIC RESULTS

| Discharge (cfs) | Peak Flow Period (hrs) | Velocity (fps) | Area (sq ft) | Hydraulic Radius (ft) | Normal Depth (ft) |
|--------------------|---------------------------|----------------|--------------|--------------------------|----------------------|
| 3.4 | 0.1 | 7.72 | 0.44 | 0.16 | 0.19 |



$0.19 + 0.5 = 0.69 < 2.0 \checkmark$
 $0.19(12) = 2.28 > 2.0 \checkmark$

LINER RESULTS

Not to Scale

| Reach | Hoisting Type | Stability Analysis | Vegetation Characteristics | | | | Permissible Shear Stress (psf) | Calculated Shear Stress (psf) | Safety Factor | Remarks |
|----------|----------------|--------------------|----------------------------|-------|------|---------|--------------------------------------|-------------------------------------|---------------|---------|
| | Stable Pattern | | Phase | Class | Type | Density | | | | |
| Straight | C125 | Unregulated | | | | | 225 | 1.91 | 1.24 | STABLE |
| | Stable D | | | | | | | | | |



 NORTH AMERICAN GREEN EROSION CONTROL MATERIALS DESIGN SOFTWARE VERSION 4.3
 NORTH AMERICAN GREEN CHANNEL PROTECTION - ENGLISH/S.I.
 USER SPECIFIED CHANNEL LINING BACK-UP COMPUTATIONS

PROJECT NAME: KERNS POND PROJECT NO.: C-17523-0002
 COMPUTED BY: LMR DATE: 1/22/2009
 FROM STATION/REACH: DCT-1B TO STATION/REACH: DCT-1B
 DRAINAGE AREA: 1.5 AC DESIGN FREQUENCY: 25 YR TEMP

 INPUT PARAMETERS

Channel Discharge : 3.4 cfs (.10 m³/s)
 Peak Flow Period : 0.1 hours
 Channel Slope : 0.156 ft/ft (0.156 m/m)
 Channel Bottom Width : 2.0 ft (.61 m)
 Left Side Slope : 2:1
 Right Side Slope : 2:1

Channel Lining : C125 Staple D
 Permi. Shear(Tp) : 2.25 psf (107.7 Pa)
 Phase = 0

 CALCULATIONS

Initial Depth Estimate = $0.16 * (3.4 / (0.156^{0.5}))^{0.375} = 0.36 \text{ ft } (.11 \text{ m})$
 Final Channel Depth (after 10 iterations) = .19 ft (0.06 m)
 Flow Area = $(2.0 * 0.2) + (0.5 * 0.19^2 * (2.0 + 2.0)) = 0.4 \text{ sq.ft } (0.0 \text{ m}^2)$
 Wet Per. = $2.0 + (0.2 * (((2.0^2) + 1)^{.5} + ((2.0^2) + 1)^{.5})) = 2.8 \text{ ft } (0.9 \text{ m})$
 Hydraulic Radius = $(0.4 / 2.8) = 0.2 \text{ ft } (0.0 \text{ m})$
 Channel Velocity = $(1.486 / 0.022) * (0.2^{0.667}) * (0.156^{.5}) = 7.7 \text{ fps } (2.4 \text{ m/s})$

Channel Effective Manning's Roughness = 0.022
 Calculated Shear (Td) = $62.4 * 0.19 * 0.156 = 1.81 \text{ psf } (86.6 \text{ Pa})$
 Safety Factor = $(Tp / Td) = (2.25 / 1.81) = 1.24$

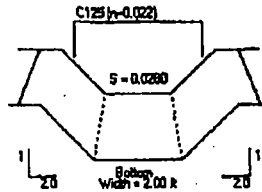
North American Green - ECADSS Version 4.3 11/22/2009 DESIGNED BY: LMR
 PROJECT NAME: KLEANSFORD PROJECT NO.: C175230002
 FROM STATION/REACH: C175A TO STATION/REACH: C175A DRAINAGE AREA: 32AC DESIGN FREQUENCY: 25YR TEMP

HYDRAULIC RESULTS

| Discharge (cfs) | Peak Flow Period (yrs) | Velocity (fps) | Area (sq ft) | Hydraulic Radius (ft) | Normal Depth (ft) |
|--------------------|---------------------------|----------------|--------------|--------------------------|----------------------|
| 7.3 | 0.1 | 5.42 | 1.35 | 0.33 | 0.45 |

$$0.46 + 0.5 = 0.96 < 2.0 \checkmark$$

$$0.46(12) = 5.52 > 2.0 \checkmark$$



LINE RESULTS

Not to Scale

| Reach | Routing Type | Stability Analysis | Vegetation Characteristics | | | | Permissible Shear Stress (psf) | Calculated Shear Stress (psf) | Safety Factor | Remarks |
|----------|----------------|--------------------|----------------------------|-------|------|---------|--------------------------------------|-------------------------------------|---------------|---------|
| | Stable Pattern | | Phase | Class | Type | Density | | | | |
| Straight | C125 | Unvegetated | | | | | 2.25 | 0.91 | 2.79 | STABLE |
| | Stable D | | | | | | | | | |

 NORTH AMERICAN GREEN EROSION CONTROL MATERIALS DESIGN SOFTWARE VERSION 4.3
 NORTH AMERICAN GREEN CHANNEL PROTECTION - ENGLISH/S.I.
 USER SPECIFIED CHANNEL LINING BACK-UP COMPUTATIONS

PROJECT NAME: KERNS POND PROJECT NO.: C-17523-0002
 COMPUTED BY: LMR DATE: 1/22/2009
 FROM STATION/REACH: ICT-1A TO STATION/REACH: ICT-1A
 DRAINAGE AREA: 3.2 AC DESIGN FREQUENCY: 25 YR TEMP

 INPUT PARAMETERS

Channel Discharge : 7.3 cfs (.21 m³/s)
 Peak Flow Period : 0.1 hours
 Channel Slope : 0.028 ft/ft (0.028 m/m)
 Channel Bottom Width : 2.0 ft (.61 m)
 Left Side Slope : 2:1
 Right Side Slope : 2:1

Channel Lining : C125 Staple D
 Permi. Shear(Tp) : 2.25 psf (107.7 Pa)
 Phase = 0

 CALCULATIONS

Initial Depth Estimate = $0.16 * (7.3 / (0.028^{0.5}))^{0.375} = 0.66 \text{ ft } (.20 \text{ m})$
 Final Channel Depth (after 9 iterations) = .46 ft (0.14 m)
 Flow Area = $(2.0 * 0.5) + (0.5 * 0.46^2 * (2.0 + 2.0)) = 1.3 \text{ sq.ft } (0.1 \text{ m}^2)$
 Wet Per. = $2.0 + (0.5 * (((2.0^2) + 1)^{.5} + ((2.0^2) + 1)^{.5})) = 4.1 \text{ ft } (1.2 \text{ m})$
 Hydraulic Radius = $(1.3 / 4.1) = 0.3 \text{ ft } (0.1 \text{ m})$
 Channel Velocity = $(1.486 / 0.022) * (0.3^{0.667}) * (0.028^{.5}) = 5.4 \text{ fps } (1.7 \text{ m/s})$

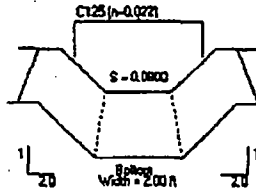
Channel Effective Manning's Roughness = 0.022
 Calculated Shear (Td) = $62.4 * 0.46 * 0.028 = 0.81 \text{ psf } (38.6 \text{ Pa})$
 Safety Factor = $(Tp / Td) = (2.25 / 0.81) = 2.79$

North American Green - ECHMS Version 4.3 11/22/2009 04:22 PM COMPILED BY: LAR
 PROJECT NAME: KERNS POND PROJECT NO: C17523-0002
 FROM STATION/REACH: CT1B TO STATION/REACH: CT1B DRAINAGE AREA: 0.9 AC DESIGN FREQUENCY: 25 YEAR

HYDRAULIC RESULTS

| Discharge (cfs) | Peak Flow Period (hrs) | Velocity (fps) | Area (sq ft) | Hydraulic Radius (ft) | Normal Depth (ft) |
|-----------------|------------------------|----------------|--------------|-----------------------|-------------------|
| 2.0 | 0.1 | 5.18 | 0.39 | 0.14 | 0.17 |

$0.17 + 0.5 = 0.67 < 2.0 \checkmark$
 $0.17(12) = 2.04 > 2.0 \checkmark$



LINER RESULTS

Not to Scale

| Reach | Rating Type | Stability Analysis | Vegetation Characteristics | | | | Permissible Shear Stress (psf) | Calculated Shear Stress (psf) | Safety Factor | Remarks |
|----------|---------------|--------------------|----------------------------|-------|------|---------|--------------------------------|-------------------------------|---------------|---------|
| | Slope Pattern | | Phase | Class | Type | Density | | | | |
| Straight | CT25 | Unvegetated | | | | | 2.25 | 0.83 | 2.72 | STABLE |
| | Single D | | | | | | | | | |

SEVEN EIGHT

 NORTH AMERICAN GREEN EROSION CONTROL MATERIALS DESIGN SOFTWARE VERSION 4.3
 NORTH AMERICAN GREEN CHANNEL PROTECTION - ENGLISH/S.I.
 USER SPECIFIED CHANNEL LINING BACK-UP COMPUTATIONS

PROJECT NAME: KERNS POND PROJECT NO.: C-17523-0002
 COMPUTED BY: LMR DATE: 1/22/2009
 FROM STATION/REACH: ICT-1B TO STATION/REACH: ICT-1B
 DRAINAGE AREA: 0.9 AC DESIGN FREQUENCY: 25 YR TEMP

 INPUT PARAMETERS

Channel Discharge : 2.0 cfs (.06 m³/s)
 Peak Flow Period : 0.1 hours
 Channel Slope : 0.08 ft/ft (0.08 m/m)
 Channel Bottom Width : 2.0 ft (.61 m)
 Left Side Slope : 2:1
 Right Side Slope : 2:1

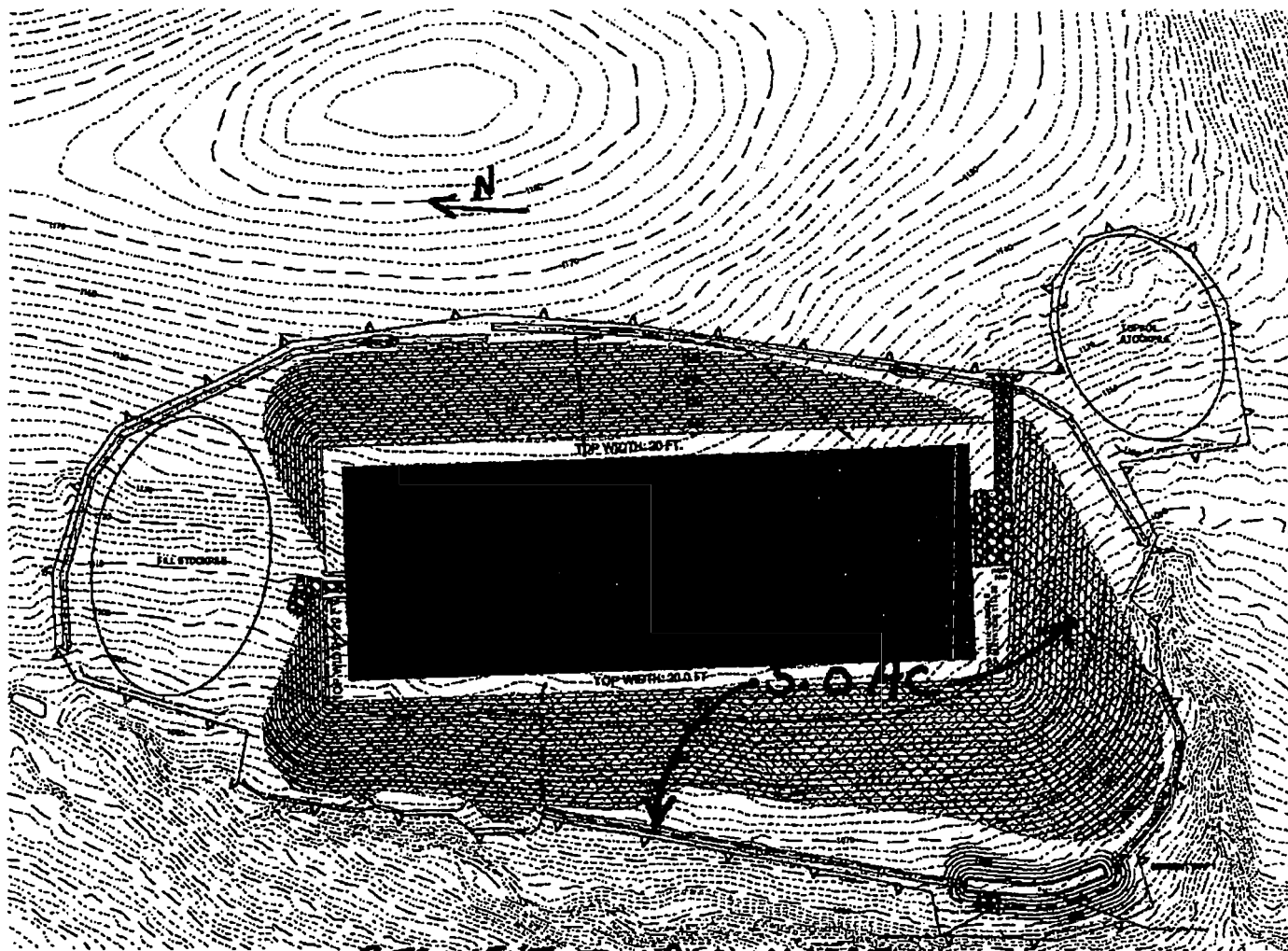
Channel Lining : C125 Staple D
 Permi. Shear(Tp) : 2.25 psf (107.7 Pa)
 Phase = 0

 CALCULATIONS

Initial Depth Estimate = $0.16 * (2.0 / (0.080^{0.5}))^{0.375} = 0.33 \text{ ft } (.10 \text{ m})$
 Final Channel Depth (after 10 iterations) = .17 ft (0.05 m)
 Flow Area = $(2.0 * 0.2) + (0.5 * 0.17^2 * (2.0 + 2.0)) = 0.4 \text{ sq.ft } (0.0 \text{ m}^2)$
 Wet Per. = $2.0 + (0.2 * (((2.0^2) + 1)^{.5} + ((2.0^2) + 1)^{.5})) = 2.7 \text{ ft } (0.8 \text{ m})$
 Hydraulic Radius = $(0.4 / 2.7) = 0.1 \text{ ft } (0.0 \text{ m})$
 Channel Velocity = $(1.486 / 0.022) * (0.1^{0.667}) * (0.080^{.5}) = 5.2 \text{ fps } (1.6 \text{ m/s})$

Channel Effective Manning's Roughness = 0.022
 Calculated Shear (Td) = $62.4 * 0.17 * 0.080 = 0.83 \text{ psf } (39.6 \text{ Pa})$
 Safety Factor = $(Tp / Td) = (2.25 / 0.83) = 2.72$

Appendix E



SEDIMENT TRAP DRAINAGE MAP

1" = 150'

STANDARD WORKSHEET #9 **Embankment Type Traps**

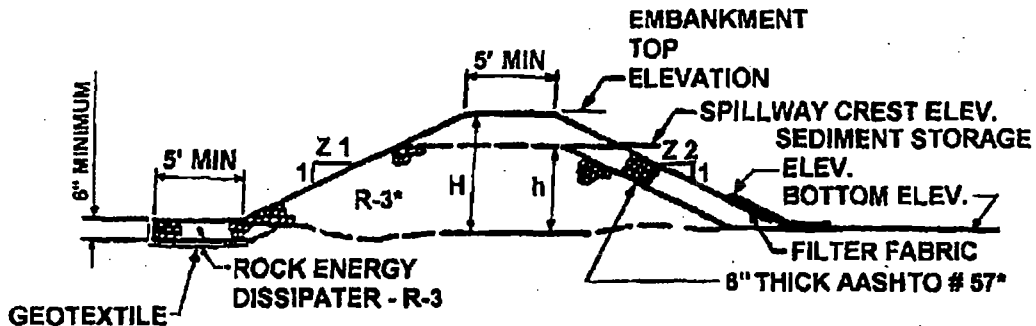
PROJECT NAME: KORNS FRESH WATER IMPOUNDMENT C-17523-0002
 LOCATION: HOPEWELL TWP. WASHINGTON CO.
 PREPARED BY: LUR DATE: 1/22/09
 CHECKED BY: _____ DATE: _____

CONSTRUCTION DETAIL:

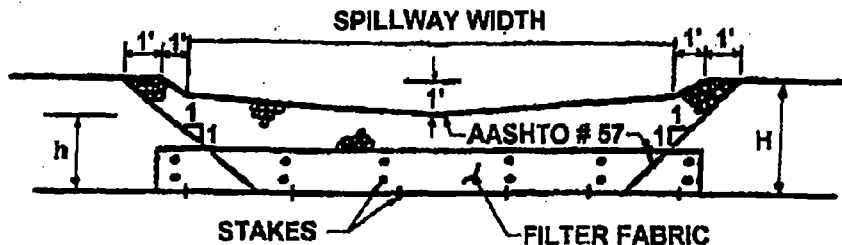
SEDIMENT TRAP NO. 1
 REQUIRED DIMENSIONS _____ X

Z1 = 2 Z2 = 2

H = 5 h = 4



SECTION THROUGH SPILLWAY*



NOTE: THE OUTLET EMBANKMENT IS TO BE COMPOSED ENTIRELY OF ROCK. THE MAIN BODY SHOULD BE LARGER STONE (R-3 MIN) WITH AN UPSTREAM LAYER OF SMALLER STONE (AASHTO #57 MAX).

NOTE: SHOW ALL DETAILS AND CONSTRUCTION DIMENSIONS ON PLAN DRAWINGS.

Minimum outlet top width (in feet) is 2 X the number of acres of contributing drainage area or 2 X h, whichever is greater. Maximum outlet side slope is 2:1.

Maximum embankment height is 5 feet. Outlet crest must be set at least 1 foot below top of embankment.

Outlet to stable erosion resistant areas.

Increase outlet top width to 6 X the number of acres of contributing drainage area when traps do not outlet into channels.

Minimum water depth of trap is 2 feet.

STANDARD WORKSHEET #8
Sediment Trap Data

PROJECT NAME: KEENS FARM ROAD

LOCATION: HOPKINS TWP. WASHINGTON CO.

PREPARED BY: BAL

DATE: 1/21/09

CHECKED BY: _____

DATE: _____

| | | | | | |
|-----------------------------------|--------|--------|-------------|-----------|--|
| TRAP NUMBER | #1 | | | | |
| DRAINAGE AREA (5 ACRES MAX) AC | 5.0 | | | | |
| REQUIRED CAPACITY (2000 CF/AC) CF | 10,000 | | | | |
| * AVERAGE BOTTOM LENGTH (FT) | 130 | | | | |
| * AVERAGE BOTTOM WIDTH (FT) | 10 | | | | |
| BOTTOM ELEVATION (FT) | 1051.0 | | | | |
| TOP OF EMBANKMENT ELEVATION | 1056.0 | | | | |
| CREST OF SPILLWAY ELEVATION | 1055.0 | | | | |
| CLEAN-OUT ELEVATION (@ 700CF/AC) | 1053.0 | 1052.8 | 700CF (5AC) | = 3500 CF | |
| FLOW LENGTH/WIDTH RATIO (2:1 MIN) | 3:1 | | | | |

EMBANKMENT SPILLWAYS

| | | | | | |
|--------------------------------|-----|--|--|--|--|
| OUTLET WIDTH (FT) | 10 | | | | |
| (GREATER OF 2 x # AC OR 2 x h) | | | | | |
| OUTLET SIDE SLOPES (2:1 MIN.) | 2:1 | | | | |

RISER PIPE SPILLWAYS

| | | | | | |
|---|-----|--|--|--|--|
| Dr (RISER DIAMETER, 8" MIN.) | | | | | |
| Db (BARREL DIAMETER, 6" MIN.) | | | | | |
| BARREL OUTLET ELEVATION (FT) | N/A | | | | |
| MAX WATER SURFACE ELEVATION (@ 1.5 CFS/AC. DISCHARGE) | | | | | |

OUTLET BASIN

| | | | | | |
|--------------------------|-----|-----|--|--|--|
| LENGTH (6 Db) | Ft. | N/A | | | |
| WIDTH (3 Db) | Ft. | N/A | | | |
| RIPRAP PROTECTION (Size) | | | | | |

* For Irregular shaped traps, provide stage storage data.

NOTE: Add data from this worksheet to worksheet #9 or #10 and show information on plan drawings.

Type.... Vol: Elev-Area
Name.... SED BASIN 1

Page 1.01

File.... G:\Projects\17000\17523 Mitchell Frac Pit\0002 Kerns\Doc's\Engineering\E & S\Tra

| Elevation (ft) | Planimeter (sq.in) | Area (sq.ft) | $A1+A2+\text{sqr}(A1*A2)$ (sq.ft) | Volume (cu.ft) | Volume Sum (cu.ft) |
|-------------------|-----------------------|-----------------|--------------------------------------|-------------------|-----------------------|
| 1051.00 | ----- | 1252 | 0 | 0 | 0 |
| 1052.00 | ----- | 1825 | 4589 | 1530 | 1530 |
| 1054.00 | ----- | 3046 | 7229 | 4819 | 6349 |
| 1056.00 | ----- | 4368 | 11062 | 7374 | 13723 |

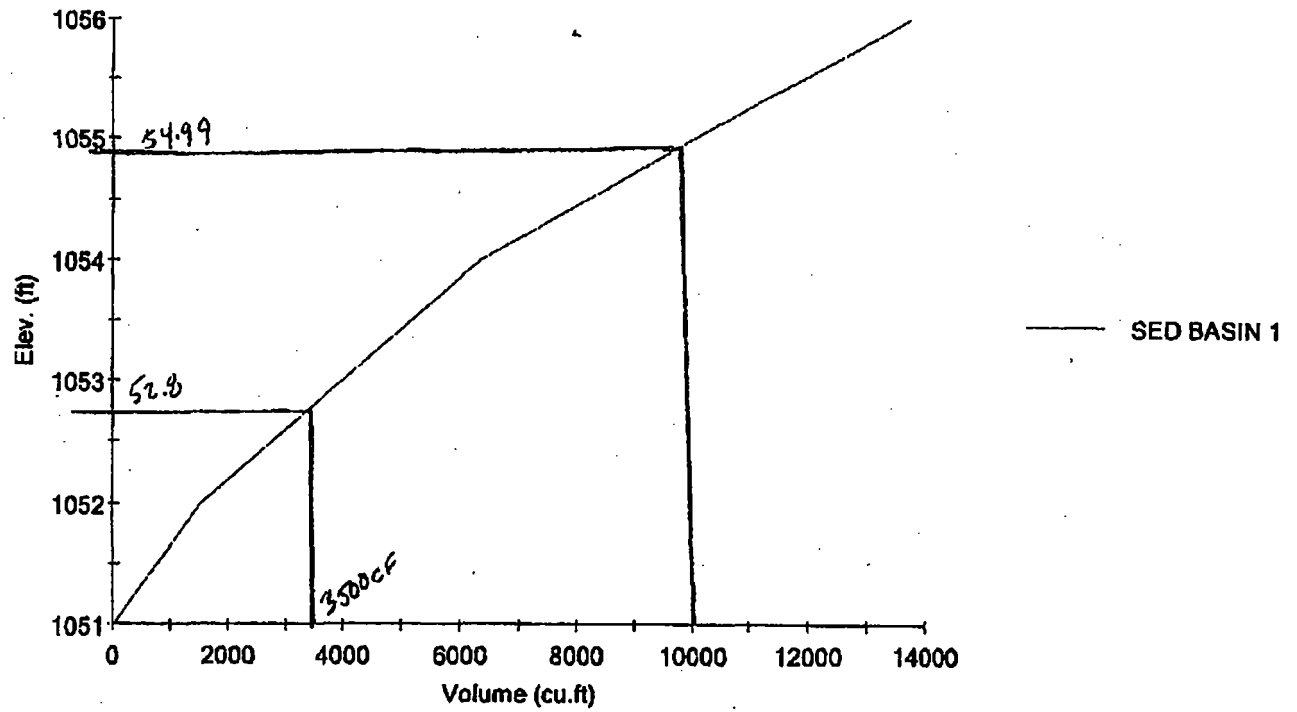
POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

$$\text{Volume} = (1/3) * (EL2-EL1) * (\text{Areal} + \text{Area2} + \text{sq.rt.}(\text{Areal}*\text{Area2}))$$

where: EL1, EL2 = Lower and upper elevations of the increment
Areal, Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

Elev. vs. Volume
SED BASIN 1



Appendix F

EROSION AND SEDIMENTATION CONTROL PLAN
STANDARD WORKSHEET #2
RECORD OF TRAINING AND EXPERIENCE
IN EROSION AND SEDIMENTATION CONTROL METHODS AND TECHNIQUES

NAME OF PLAN PREPARER: Laura M. Rusmisl, E.I.T.

FORMAL EDUCATION:

Pennsylvania State University
BS - Civil Engineering

EMPLOYMENT HISTORY:

Current Employer: The Gateway Engineers, Inc. 400 Holiday Dr. Suite 300 Pgh, PA 15220
Telephone: 412-921-4030

Former Employer: Vegeler-Ramsey & Co., Inc.
Telephone:

RECENT EROSION AND SEDIMENTATION CONTROL PLANS PREPARED:

Name of Project: Parkwest Corporate Center
County: Allegheny
Municipality: Findlay Township
Permit Number: PA-R10-A431
Approving Agency: ACCD

Name of Project: South Fayette High School
County: Allegheny
Municipality: South Fayette Township
Permit Number: PA-R10-A423
Approving Agency: ACCD

Name of Project: Bethlen Home
County: Westmoreland
Municipality: Ligonier Township
Permit Number: PAR10X243
Approving Agency: WCD

Name of Project: Sturbridge Court
County: Allegheny
Municipality: Franklin Park Borough
Permit Number: PA-R10-A580
Approving Agency: ACCD

Name of Project: Longview Estates
County: Allegheny
Municipality: South Fayette Township
Permit Number: PA-R10-A592
Approving Agency: ACCD

Name of Project: Woodlands at Trout Run
County: Allegheny
Municipality: Moon Township
Permit Number: PA-R10-A561
Approving Agency: ACCD

Name of Project: Parkes Farm Phase I,II,III,IV,V
County: Allegheny
Municipality: South Fayette Township
Permit Number: PA-R10-A558
Approving Agency: ACCD

Name of Project: Imperial Ridge
County: Allegheny
Municipality: South Park Township
Permit Number: PA-R10-A548
Approving Agency: ACCD

Name of Project: Silver Oaks
County: Allegheny
Municipality: Robinson Township
Permit Number: PA-R10-A603
Approving Agency: ACCD

Name of Project: Foxwood Knolls
County: Allegheny
Municipality: Moon Township
Permit Number: PA-R10-A600
Approving Agency: ACCD

Name of Project: Wiltshire Estates
County: Allegheny
Municipality: Moon Township
Permit Number: PA-R10-A609
Approving Agency: ACCD

Name of Project: DR Ice Sports Complex
County: Westmoreland
Municipality: City of New Kensington
Permit Number: PA-R10-X311
Approving Agency: WCD

Name of Project: Peterswood Park
County: Washington
Municipality: Peters Township
Permit Number: PAG2-0063-03001
Approving Agency: WCCD

Name of Project: Village Shops at the Monroeville Mall
County: Allegheny
Municipality: Municipality of Monroeville
Permit Number: PA-R10-A620
Approving Agency: ACCD

Name of Project: Sweet Brier Plan of Lots
County: Beaver
Municipality: Hopewell Township
Permit Number: PAG2-0004-03-003
Approving Agency: BCCD

KERNS FRESHWATER IMPOUNDMENT

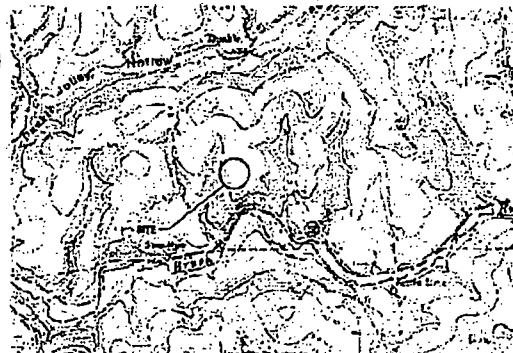
HOPEWELL TOWNSHIP
WASHINGTON COUNTY

PREPARED FOR:

RANGE RESOURCES APPALACHIA, LLC
380 SOUTHPOINTE BLVD. SUITE 300
CANONSBURG, PA 15317

CALL BEFORE YOU DIG!
PENNSYLVANIA LAW REQUIRES
3 WORKING DAYS NOTICE FOR
CONSTRUCTION PROJECTS AND 2 WORKING
DAYS IN DESIGN STAGE - STOP CALL
Pennsylvania One Call System, Inc.
 1-800-242-1778
PO Box 2000

CONSULTANTS



ESTABLISHMENT MAP

LIST OF UTILITIES

| OWG No. | SHEET TITLE | INCLUDED |
|---------|---|----------|
| 0000 | COVER SHEET | ✓ |
| C101 | EROSION AND SEDIMENTATION CONTROL PLAN | ✓ |
| C102 | EROSION AND SEDIMENTATION CONTROL DETAILS | ✓ |
| C103 | EROSION AND SEDIMENTATION CONTROL DETAILS | ✓ |
| C104 | EROSION AND SEDIMENTATION CONTROL DETAILS | ✓ |
| | | □ |
| | | □ |
| | | □ |
| | | □ |
| | | □ |

[illegible]

GATEWAY



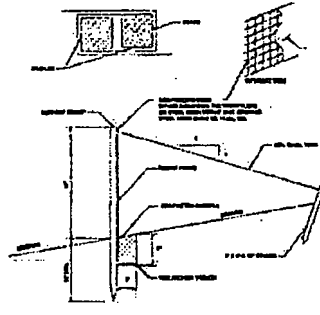
KERNS FRESHWATER IMPOUNDMENT

AND NEEL FOR:
RANGE RESOURCES APPALACHIA, LLC

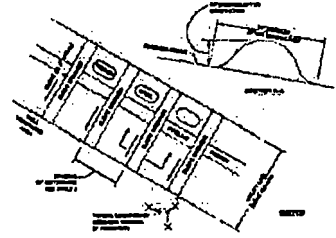
COVER
PAGE

Project Number: 4-1172-9900
 Drawing Number: E.L.A.
 Date Issued: 01-01-2000
 Order Number: 1000000000
 Order Qty: 1000
 Order Qty: 1000

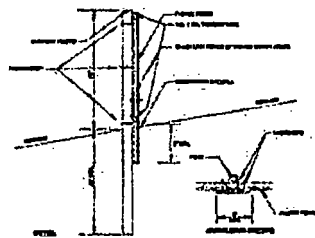
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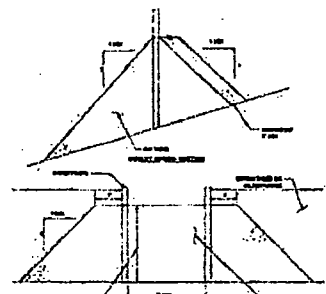
STANDARD CONSTRUCTION DETAIL, SEE SHEET 103 FOR DETAILS



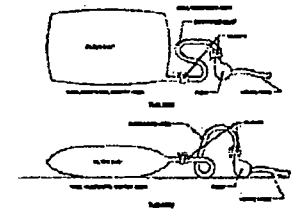
STANDARD CONSTRUCTION DETAIL, SEE SHEET 103 FOR DETAILS



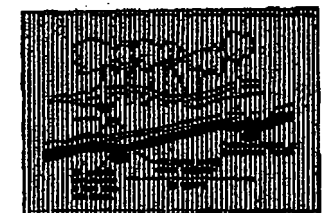
STANDARD CONSTRUCTION DETAIL, SEE SHEET 103 FOR DETAILS



STANDARD CONSTRUCTION DETAIL, SEE SHEET 103 FOR DETAILS



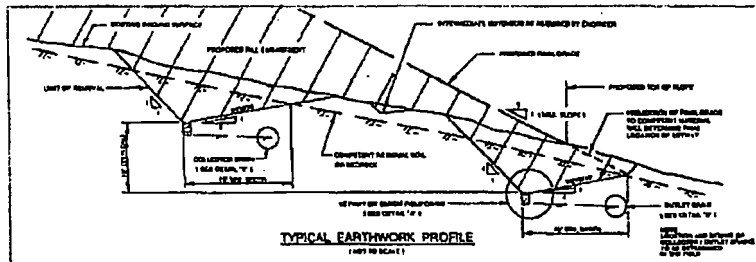
STANDARD CONSTRUCTION DETAIL, SEE SHEET 103 FOR DETAILS



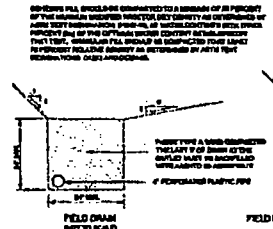
| Notes | Dimensions |
|--------------------------|------------|
| 1. 1/2" DIA. HOLE | 1/2" |
| 2. 1/4" DIA. HOLE | 1/4" |
| 3. 1/8" DIA. HOLE | 1/8" |
| 4. 1/16" DIA. HOLE | 1/16" |
| 5. 1/32" DIA. HOLE | 1/32" |
| 6. 1/64" DIA. HOLE | 1/64" |
| 7. 1/128" DIA. HOLE | 1/128" |
| 8. 1/256" DIA. HOLE | 1/256" |
| 9. 1/512" DIA. HOLE | 1/512" |
| 10. 1/1024" DIA. HOLE | 1/1024" |
| 11. 1/2048" DIA. HOLE | 1/2048" |
| 12. 1/4096" DIA. HOLE | 1/4096" |
| 13. 1/8192" DIA. HOLE | 1/8192" |
| 14. 1/16384" DIA. HOLE | 1/16384" |
| 15. 1/32768" DIA. HOLE | 1/32768" |
| 16. 1/65536" DIA. HOLE | 1/65536" |
| 17. 1/131072" DIA. HOLE | 1/131072" |
| 18. 1/262144" DIA. HOLE | 1/262144" |
| 19. 1/524288" DIA. HOLE | 1/524288" |
| 20. 1/1048576" DIA. HOLE | 1/1048576" |

Notes: 1. All dimensions are in inches unless otherwise specified. 2. All dimensions are to center of hole unless otherwise specified. 3. All dimensions are to be maintained throughout the entire length of the hole.

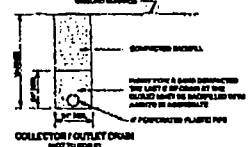
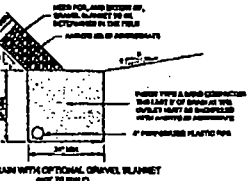
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2. The name of the project is Kerns Freshwater Impoundment, located in Washington County, Virginia.
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18. The name of the project is Kerns Freshwater Impoundment, located in Washington County, Virginia.
19. The name of the project is Kerns Freshwater Impoundment, located in Washington County, Virginia.
20. The name of the project is Kerns Freshwater Impoundment, located in Washington County, Virginia.



TYPICAL EARTHWORK PROFILE



DETAIL "A"



DETAIL "B"

GATEWAY

Engineering & Construction Services

1000 West 10th Street, Suite 1000
Tulsa, Oklahoma 74103-1000
Phone: (918) 437-1000 Fax: (918) 437-1001

KERNS FRESHWATER IMPOUNDMENT

WASHINGTON COUNTY

RANGE RESOURCES APPALACHIA, LLC

380 SOUTHPOINTE BLVD., SUITE 300
CHARLOTTE, NC 28207

EROSION AND SEDIMENTATION CONTROL DETAILS

Project Number: 01000000

Revision Number: 01

Drawn By: J. L. Smith

Checked By: J. L. Smith

Date: 01/01/00

C132

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എന്നിവയെക്കുറിച്ച് കൂടുതൽ അറിയാൻ www.mca.gov.in സന്ദർശിക്കുക

1. The first step in the process of the investigation is the identification of the problem. This is done by the investigator who is assigned to the case. The investigator will then conduct a thorough search of the records to determine the facts of the case.

2. The second step is the collection of evidence. This is done by the investigator who will gather all the information that is relevant to the case. This may include interviews with witnesses, review of documents, and other sources of information.

3. The third step is the analysis of the evidence. This is done by the investigator who will evaluate the information that has been collected and determine what it means. This may involve comparing the evidence to known facts and theories.

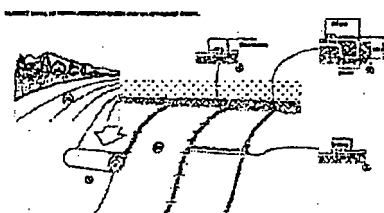
4. The fourth step is the presentation of the findings. This is done by the investigator who will write a report that summarizes the results of the investigation. This report will be presented to the appropriate authorities for their review and action.

5. The fifth step is the follow-up. This is done by the investigator who will monitor the situation to ensure that the problem has been resolved and that no further action is required.

| අනුමැතිය ලබා දුන් දිනය | අනුමැතිය ලබා දුන් ස්ථානය | අනුමැතිය ලබා දුන් ප්‍රධානියා |
|------------------------|--------------------------|------------------------------|
| 2019/07/27 | අනුමැතිය ලබා දුන් ස්ථානය | අනුමැතිය ලබා දුන් ප්‍රධානියා |
| 2019/07/27 | අනුමැතිය ලබා දුන් ස්ථානය | අනුමැතිය ලබා දුන් ප්‍රධානියා |
| 2019/07/27 | අනුමැතිය ලබා දුන් ස්ථානය | අනුමැතිය ලබා දුන් ප්‍රධානියා |

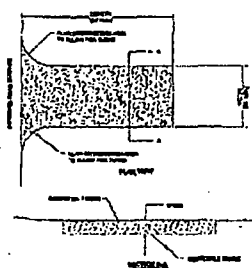
| Year | Number of cases | Percentage of cases |
|------|-----------------|---------------------|
| 1990 | 100 | 100% |
| 1991 | 120 | 120% |
| 1992 | 150 | 150% |
| 1993 | 180 | 180% |
| 1994 | 200 | 200% |
| 1995 | 220 | 220% |
| 1996 | 240 | 240% |
| 1997 | 260 | 260% |
| 1998 | 280 | 280% |
| 1999 | 300 | 300% |
| 2000 | 320 | 320% |
| 2001 | 340 | 340% |
| 2002 | 360 | 360% |
| 2003 | 380 | 380% |
| 2004 | 400 | 400% |
| 2005 | 420 | 420% |
| 2006 | 440 | 440% |
| 2007 | 460 | 460% |
| 2008 | 480 | 480% |
| 2009 | 500 | 500% |
| 2010 | 520 | 520% |
| 2011 | 540 | 540% |
| 2012 | 560 | 560% |
| 2013 | 580 | 580% |
| 2014 | 600 | 600% |
| 2015 | 620 | 620% |
| 2016 | 640 | 640% |
| 2017 | 660 | 660% |
| 2018 | 680 | 680% |
| 2019 | 700 | 700% |
| 2020 | 720 | 720% |
| 2021 | 740 | 740% |
| 2022 | 760 | 760% |
| 2023 | 780 | 780% |
| 2024 | 800 | 800% |
| 2025 | 820 | 820% |
| 2026 | 840 | 840% |
| 2027 | 860 | 860% |
| 2028 | 880 | 880% |
| 2029 | 900 | 900% |
| 2030 | 920 | 920% |
| 2031 | 940 | 940% |
| 2032 | 960 | 960% |
| 2033 | 980 | 980% |
| 2034 | 1000 | 1000% |
| 2035 | 1020 | 1020% |
| 2036 | 1040 | 1040% |
| 2037 | 1060 | 1060% |
| 2038 | 1080 | 1080% |
| 2039 | 1100 | 1100% |
| 2040 | 1120 | 1120% |
| 2041 | 1140 | 1140% |
| 2042 | 1160 | 1160% |
| 2043 | 1180 | 1180% |
| 2044 | 1200 | 1200% |
| 2045 | 1220 | 1220% |
| 2046 | 1240 | 1240% |
| 2047 | 1260 | 1260% |
| 2048 | 1280 | 1280% |
| 2049 | 1300 | 1300% |
| 2050 | 1320 | 1320% |
| 2051 | 1340 | 1340% |
| 2052 | 1360 | 1360% |
| 2053 | 1380 | 1380% |
| 2054 | 1400 | 1400% |
| 2055 | 1420 | 1420% |
| 2056 | 1440 | 1440% |
| 2057 | 1460 | 1460% |
| 2058 | 1480 | 1480% |
| 2059 | 1500 | 1500% |
| 2060 | 1520 | 1520% |
| 2061 | 1540 | 1540% |
| 2062 | 1560 | 1560% |
| 2063 | 1580 | 1580% |
| 2064 | 1600 | 1600% |
| 2065 | 1620 | 1620% |
| 2066 | 1640 | 1640% |
| 2067 | 1660 | 1660% |
| 2068 | 1680 | 1680% |
| 2069 | 1700 | 1700% |
| 2070 | 1720 | 1720% |
| 2071 | 1740 | 1740% |
| 2072 | 1760 | 1760% |
| 2073 | 1780 | 1780% |
| 2074 | 1800 | 1800% |
| 2075 | 1820 | 1820% |
| 2076 | 1840 | 1840% |
| 2077 | 1860 | 1860% |
| 2078 | 1880 | 1880% |
| 2079 | 1900 | 1900% |
| 2080 | 1920 | 1920% |
| 2081 | 1940 | 1940% |
| 2082 | 1960 | 1960% |
| 2083 | 1980 | 1980% |
| 2084 | 2000 | 2000% |
| 2085 | 2020 | 2020% |
| 2086 | 2040 | 2040% |
| 2087 | 2060 | 2060% |
| 2088 | 2080 | 2080% |
| 2089 | 2100 | 2100% |
| 2090 | 2120 | 2120% |
| 2091 | 2140 | 2140% |
| 2092 | 2160 | 2160% |
| 2093 | 2180 | 2180% |
| 2094 | 2200 | 2200% |
| 2095 | 2220 | 2220% |
| 2096 | 2240 | 2240% |
| 2097 | 2260 | 2260% |
| 2098 | 2280 | 2280% |
| 2099 | 2300 | 2300% |
| 2100 | 2320 | 2320% |
| 2101 | 2340 | 2340 |

1. Einleitung



1. Identify the key concepts and theories that underpin the research, including the theoretical framework, research methodology, and research design.
2. Summarize the objectives of the research, including the research questions, hypotheses, and the overall purpose of the study.
3. Describe the research methods used, including the data collection methods, data analysis methods, and the sampling strategy.
4. Present the findings of the research, including the results of the data analysis, the conclusions drawn from the findings, and the implications for practice.
5. Discuss the limitations of the research, including the strengths and weaknesses of the study, the limitations of the research design, and the limitations of the data.
6. Provide a conclusion that summarizes the key findings of the research, the implications for practice, and the recommendations for future research.

HOW TO ORDER



ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED EXCEPT WHERE SHOWN OTHERWISE IN MARGINS

1. I have read the above document and agree with its contents.

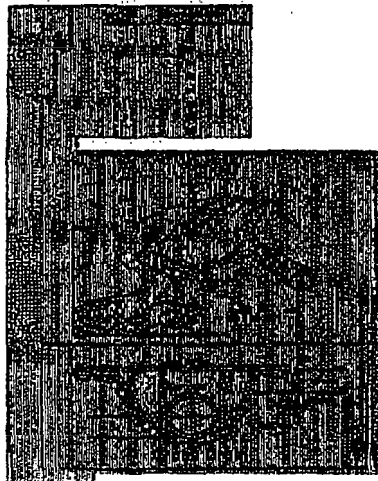
2. I have read the above document and agree with its contents.

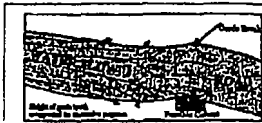
3. I have read the above document and agree with its contents.

4. I have read the above document and agree with its contents.

5. I have read the above document and agree with its contents.

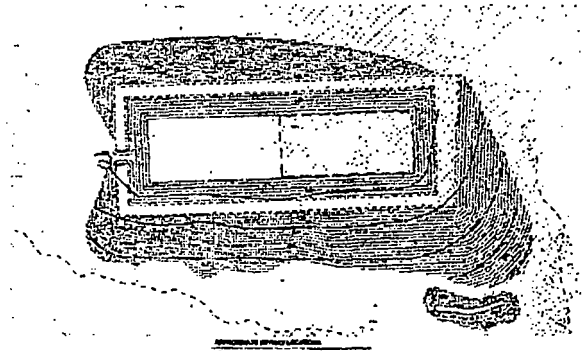
DATE OF COMPLETION _____





THESE

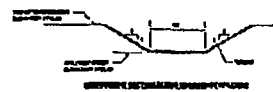
RECEIVED BY THE DIRECTOR, FBI, 11/11/64



MAINTENANCE SCHEDULE

| NAME OF THE PERSON | DATE OF BIRTH | DATE OF DEATH | REMARKS |
|--------------------|---------------|---------------|------------|
| 1. Mr. A. B. C. | 1910-01-01 | 1980-01-01 | 1970-01-01 |
| 2. Mr. D. E. F. | 1915-01-01 | 1985-01-01 | 1975-01-01 |
| 3. Mr. G. H. I. | 1920-01-01 | 1990-01-01 | 1980-01-01 |
| 4. Mr. J. K. L. | 1925-01-01 | 1995-01-01 | 1985-01-01 |
| 5. Mr. M. N. O. | 1930-01-01 | 2000-01-01 | 1990-01-01 |
| 6. Mr. P. Q. R. | 1935-01-01 | 2005-01-01 | 1995-01-01 |
| 7. Mr. S. T. U. | 1940-01-01 | 2010-01-01 | 2000-01-01 |
| 8. Mr. V. W. X. | 1945-01-01 | 2015-01-01 | 2005-01-01 |
| 9. Mr. Y. Z. A. | 1950-01-01 | 2020-01-01 | 2010-01-01 |
| 10. Mr. B. C. D. | 1955-01-01 | 2025-01-01 | 2015-01-01 |

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WFO

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MODIFIED COMPLETION DETAIL, 64

GATEWAY
Consulting Engineers & Surveyors
400 Haddonfield Drive, Suite 200 Haddonfield, PA 19033
Phone (610) 881-1271 • Fax (610) 881-1299
• Telex: 947246G-GE • Telegraph: 947246G-GE



ADDITIONAL RECORD

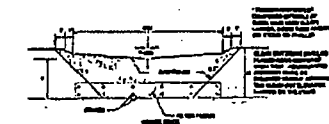
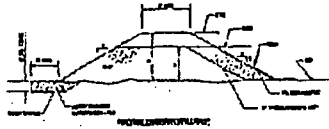
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|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|

KEBNS FRESHWATER IMPQINDMENT

**PAULINE A. FORC
RANGE RESOURCES APPALACHIA, LLC**

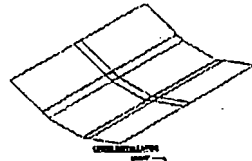
**EROSION AND
SEDIMENTATION
CONTROL DETAILS**
Project Number: C-133B-0000
Drawing Made At: 10/1/88
Date Issued: 10/1/88
Issue Number: 10/1/88
Drawn By: JAC
Checked By: WJB
Project Manager: WJB
C133

C133



| ITEM | QTY | UNIT | PRICE | TOTAL |
|------|-----|-------------|-------|-------|
| 1 | 1 | LINEAL FOOT | 1.00 | 1.00 |
| 2 | 1 | LINEAL FOOT | 1.00 | 1.00 |
| 3 | 1 | LINEAL FOOT | 1.00 | 1.00 |
| 4 | 1 | LINEAL FOOT | 1.00 | 1.00 |
| 5 | 1 | LINEAL FOOT | 1.00 | 1.00 |
| 6 | 1 | LINEAL FOOT | 1.00 | 1.00 |
| 7 | 1 | LINEAL FOOT | 1.00 | 1.00 |
| 8 | 1 | LINEAL FOOT | 1.00 | 1.00 |
| 9 | 1 | LINEAL FOOT | 1.00 | 1.00 |
| 10 | 1 | LINEAL FOOT | 1.00 | 1.00 |

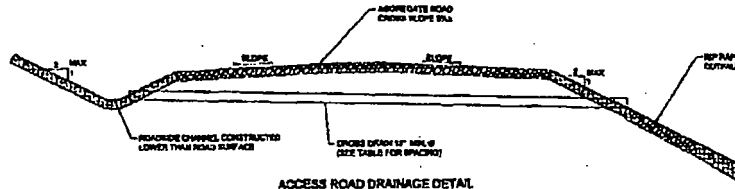
STANDARD DETAIL #1
CROSS-SECTION OF DRAINAGE DITCH



| ITEM | QTY | UNIT | PRICE | TOTAL |
|------|-----|-------------|-------|-------|
| 1 | 1 | LINEAL FOOT | 1.00 | 1.00 |
| 2 | 1 | LINEAL FOOT | 1.00 | 1.00 |
| 3 | 1 | LINEAL FOOT | 1.00 | 1.00 |
| 4 | 1 | LINEAL FOOT | 1.00 | 1.00 |
| 5 | 1 | LINEAL FOOT | 1.00 | 1.00 |
| 6 | 1 | LINEAL FOOT | 1.00 | 1.00 |
| 7 | 1 | LINEAL FOOT | 1.00 | 1.00 |
| 8 | 1 | LINEAL FOOT | 1.00 | 1.00 |
| 9 | 1 | LINEAL FOOT | 1.00 | 1.00 |
| 10 | 1 | LINEAL FOOT | 1.00 | 1.00 |

STANDARD DETAIL #2
CROSS-SECTION OF DRAINAGE DITCH

STANDARD DETAIL #3
CROSS-SECTION OF DRAINAGE DITCH



ACCESS ROAD DRAINAGE DETAIL



| NO. | DATE | REVISION |
|-----|-----------|-------------------------|
| 1 | 10/1/2010 | ISSUED FOR CONSTRUCTION |
| 2 | 10/1/2010 | ISSUED FOR CONSTRUCTION |
| 3 | 10/1/2010 | ISSUED FOR CONSTRUCTION |
| 4 | 10/1/2010 | ISSUED FOR CONSTRUCTION |
| 5 | 10/1/2010 | ISSUED FOR CONSTRUCTION |
| 6 | 10/1/2010 | ISSUED FOR CONSTRUCTION |
| 7 | 10/1/2010 | ISSUED FOR CONSTRUCTION |
| 8 | 10/1/2010 | ISSUED FOR CONSTRUCTION |
| 9 | 10/1/2010 | ISSUED FOR CONSTRUCTION |
| 10 | 10/1/2010 | ISSUED FOR CONSTRUCTION |

KERNS FRESHWATER IMPOUNDMENT
HARTWELL TOWNSHIP
WALKER COUNTY
GEORGIA
RANGE RESOURCES APPALACHIA, LLC
200 SOUTHPOINTE BLVD, SUITE 200
CHATTANOOGA, TN 37405

ENGINEER AND
SURVEYOR
C134